CLAIMS

1. (amended) A method for humidifying a supply gas of a fuel cell, comprising transferring 71% or more of the water content from a low-pressure first gas at 1 to 4 atm to a low-pressure second gas at 1 to 4 atm with the use of a humidifying apparatus fabricated by loading a hollow fiber membrane element in which a hollow fiber membrane bundle comprising a large number of hollow fiber membranes is anchored with tubesheets at both ends with the hollow fiber membranes being in the opened state, into a container having at least a supply port of a first gas, a discharge port of the first gas, a supply port of a second gas and a discharge port of the second gas, such that the space communicating with the hollow side of the hollow fiber membranes is isolated from the space communicating with the outer side of the hollow fiber membranes, wherein

(a) the inner diameter of the hollow fiber membranes is from more than 500 μm to less than 1,500 μm,

(b) the water vapor permeation rate (P'_{H2O}) of the hollow fiber membranes is 0.5×10^{-3} cm^3 (STP)/cm^2·sec·cm Hg or more,

(c) the ratio (P'_{H2O}/P'_{O2}) of the water vapor permeation rate to the oxygen gas permeation rate of the hollow fiber membranes is 10 or more,

(d) the elongation at tensile break of the hollow fiber membranes after hot water treatment in hot water at 100°C for 50 hours is 80% or more of that before the hot water treatment,

(e) assuming that the effective length of the hollow fiber membrane element is L and the inner diameter of the container into which said hollow fiber membrane element is loaded is D, L/D is from 2 to 6, and

(f) the membrane filling percentage of the hollow fiber membrane bundle constituting the hollow fiber membrane element is from 35 to 55%.

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2. (amended) The method for humidifying a supply gas of a fuel cell as claimed in claim 1, wherein 71% or more of the water content is transferred from a low-pressure first gas at 1 to 3 atm to a low-pressure second gas at 1 to 3 atm.

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9. (amended) The method for humidifying a supply gas of a fuel cell as claimed in claim 1 or 2, wherein the first gas is an exhaust gas from the cathode of a fuel cell and the second gas is an air supplied to the cathode of the fuel cell.

10. (added) A humidifying apparatus for fuel cells, comprising a hollow fiber membrane element in which a hollow fiber membrane bundle comprising a large number of hollow fiber membranes is anchored with tubesheets at both ends with the hollow fiber membranes being in the opened state, and a container having at least a supply port of the first gas, a discharge port of the first gas, a supply port of the second gas and a discharge port of the second gas, the hollow fiber membrane element being loaded into the container such that the space communicating with the hollow side of the hollow fiber membranes is isolated from the space communicating with the outer side of the hollow fiber membranes, wherein

(a) the inner diameter of the hollow fiber membranes is from more than 500 μm to less than 1,500 μm,

(b) the water vapor permeation rate (P'_{H2O}) of the hollow fiber membranes is 0.5×10^{-3} cm^3 (STP)/cm^2·sec·cm Hg or more,

(c) the ratio (P'_{H2O}/P'_{O2}) of the water vapor permeation rate to the oxygen gas permeation rate of the hollow fiber membrane is 10 or more,

(d) the elongation at tensile break of the hollow fiber membranes after hot water treatment in hot water at 100°C for 50 hours is 80% or more of that before the hot water treatment,

(e) assuming that the effective length of the hollow fiber membrane element is L and the inner diameter of the container into which said hollow fiber membrane element is loaded is D, L/D is from 2 to 6,

(f) the membrane filling percentage of the hollow fiber membrane bundle constituting the hollow fiber membrane element is from 35 to 55%,

(g) the first gas is introduced into the hollow fiber membrane from the opening of the tubesheet at one end of the hollow fiber membrane element, the second gas is introduced through communication holes which is provided in a core tube disposed along the hollow fiber membrane bundle almost in the center part of the hollow fiber membrane bundle constituting the hollow fiber membrane element and which is provided only in the vicinity of the tubesheet on the side opposite the first gas-introducing side, and the first and second gases are allowed to countercurrently flow with intervention of the hollow fiber membranes, and

(h) 71% or more of the water content is transferred from a low-pressure first or second gas at 1 to 4 atm to a low-pressure second or first gas at 1 to 4 atm.